Article

Factors affecting Canadian veterinarians' use of analgesics when dehorning beef and dairy calves

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Abstract — Data collected through a national, randomized mail survey (response rate 50%) were used to identify reasons why veterinarians were likely (i) to use analgesic drugs when dehorning calves, and (ii) to perceive dehorning without analgesia as very painful. Logistic regression analysis indicated that veterinarians were more likely to be analgesic users the more they perceived that dehorning without analgesia was painful (OR = 1.7, $P < 0.001$). Other positive influences were if the veterinarian worked in British Columbia or Alberta (OR = 5.9, $P = 0.005$), and if they were primarily in dairy practice (OR = 3.7, $P = 0.012$) rather than beef practice. This effect of dairy practice was negated if the veterinarian also perceived that owners were unwilling to pay for analgesia (interaction term: OR = 0.25, $P = 0.038$). Veterinarians were also less likely to perceive dehorning without analgesia as very painful if they perceived that owners were unwilling to pay (OR = 0.58, $P = 0.029$). However, this effect on pain perception was offset by concern for personal safety (OR = 2.7, $P = 0.015$). The results are consistent with the relatively high level of outreach about animal welfare among farmers and veterinarians in the western provinces. The results confirm that many veterinarians' approach to pain management for dehorning is influenced considerably by concern about cost. However, pain management for dehorning is not expensive and there is unequivocal evidence that dehorning calves without pain management causes significant distress. Continuing education of veterinarians should help to increase analgesic usage.

Résumé — Facteurs influençant l'utilisation d'analgésiques par les vétérinaires canadiens lors de l'écornage des veaux de boucherie et laitiers. Des données recueillies par une enquête postale nationale aléatoire (taux de réponse de 50 %) ont été utilisées pour identifier les raisons pour lesquelles les vétérinaires étaient susceptibles (i) d'utiliser des analgésiques lors de l'écornage des veaux et de percevoir (ii) l'écornage sans analgésie comme très douloureux. Une analyse de régression logistique a indiqué que plus les vétérinaires percevaient l'écornage sans analgésie comme très douloureux, plus ils étaient susceptibles d'utiliser des analgésiques (OR = 1,7, $P < 0,001$). Les autres facteurs positifs étaient un lieu de travail situé en Colombie-Britannique ou en Alberta (OR = 5,9, $P = 0,005$) et une pratique principalement laitière (OR = 3,7, $P = 0,012$) plutôt que de boucherie. Cet effet de pratique laitière ne tenait plus si le vétérinaire percevait également que les propriétaires n'étaient pas d'accord pour payer l'analgésie (terme d'interaction : OR = 0,25, $P = 0,038$). Les vétérinaires étaient également moins enclins à percevoir l'écornage sans analgésie comme très douloureux s'ils percevaient que les propriétaires n'étaient pas d'accord à payer (OR = 0,58, $P = 0,029$). Cependant, cet effet sur la perception de la douleur était contrecarré par le souci de sécurité personnel (OR = 2,7, $P = 0,015$). Ces résultats sont compatibles avec le niveau relativement élevé du souci de la population pour le bien-être animal parmi les fermiers et les vétérinaires des provinces de l'Ouest. Ces résultats confirment que l'attitude de plusieurs vétérinaires envers le contrôle de la douleur lors de l'écornage est considérablement influencée par les coûts. Cependant, le contrôle de la douleur lors de l'écornage n'est pas dispendieux et il y a des preuves évidentes et significatives de détresse lors de l'écornage des veaux sans contrôle de la douleur. L'éducation continue des vétérinaires devrait aider à accroitre l'usage d'analgésiques.

(Traduit par Docteur André Blouin)

Can Vet J 2007;48:1129–1136

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This research was funded by grants from the Animal Welfare Foundation of Canada, and the Sir James Dunn Animal Welfare Centre, Atlantic Veterinary College, University of Prince Edward Island.

Some of the data described in this paper were presented at the annual meeting of the American College of Veterinary Anesthesiologists in Chicago Illinois on October 12, 2006, with an abstract appearing subsequently in *Veterinary Anaesthesia and Analgesia.*

Table 1. Surgical procedures and medical conditions investigated in a survey of Canadian veterinarians' use of analgesics in cattle, pigs and horses (9)

Dairy	Beef	Pigs	Horses
Surgical procedures			
Castration up to 6 mo old[a]	Castration up to 6 mo old[a]	Castration up to 3 wk of age	Castration (routine)[b]
Castration over 6 mo old[a]	Castration over 6 mo old[a]	—	Castration (cryptorchid)
Cesarian section	Cesarian section	Cesarian section	—
Claw amputation		Ear notching	—
Dehorning up to 6 mo old[a]	Dehorning up to 6 mo old[a]	Inguinal hernia repair[b]	Inguinal hernia repair[b]
Dehorning over 6 mo old[a]	Dehorning over 6 mo old[a]	Tail docking	—
Omentopexy	—	—	—
Umbilical hernia repair up to 3 mo old	Umbilical hernia repair up to 3 mo old	—	Umbilical hernia repair[b]
Medical conditions			
Acute toxic mastitis	—	—	—
Acute lameness in cows (onset within last 48 h)	—	—	—
Chronic lameness in cows (onset more than 48 h previously)	—	Chronic lameness in sows[c]	Dentistry — extraction
Dystocia (nonsurgical)	Dystocia (nonsurgical)	—	Dentistry — floating
Corneal ulcer	Corneal ulcer	—	Corneal ulcer

[a] Method not specified
[b] Age not specified
[c] Time of onset not specified

Introduction

In 2001, a randomized national survey of Canadian veterinarians indicated that they were more likely to give postoperative analgesic drugs to dogs undergoing ovariohysterectomy if the practice had at least 1 animal health technician per 2 veterinarians, and if the veterinarian perceived the surgery to be painful (1). The likelihood of postoperative analgesic usage was reduced if the veterinarian had graduated from the Western College of Veterinary Medicine or the Université de Montréal (1). In the case of farm animals, descriptions of analgesic usage by bovine and equine veterinarians in the UK have been published (2–5). Although the question of Canadian veterinarians' management of pain in farm animals is being aired (6–8), to our knowledge, there are no data describing this management and the factors affecting it. Therefore, in 2004/05, we conducted a national survey of Canadian veterinarians to examine the extent of their analgesic usage in beef and dairy cattle, pigs, and horses, and to identify factors predicting analgesic use. The descriptive data have been presented in a previous paper (9). This paper describes the factors influencing veterinarians' use of analgesic drugs for bovine dehorning and the factors affecting veterinarians' perception that the procedure is painful if performed without analgesia.

Materials and methods

The study design and details of data collection have been described in detail in a previous paper (9). Data were collected by means of a mailed questionnaire, a copy of which is available on request. All eligible veterinarians in Atlantic Canada and a random sample of eligible veterinarians from the rest of Canada were surveyed (n = 1431). Of these, 585 completed the questionnaire, providing demographic information, information about their attitudes to pain, and information about their use of analgesics in dairy cattle, beef cattle, pigs, and horses, for common medical conditions and surgeries (Table 1) (9). The research was approved by the Research Ethics Board of the University of Prince Edward Island. The veterinarians' names did not appear on the questionnaires, and the data were managed and analyzed without the respondents being identified.

Data management

The data on analgesic use for most surgeries and medical conditions had a bimodal distribution (9). Based on this and on best analgesic practice, the outcome was dichotomized into analgesic users (those respondents who gave analgesics to 100% of cases) and analgesic nonusers (those respondents who gave analgesics to less than 100% of their cases). However, not all respondents conducted all surgeries or treated all medical conditions within all 4 animal groups. In order to include data from as many respondents as possible and to compare analgesic usage in different animal groups, we applied 2 criteria. One criterion concerned the animal group that the respondent dealt with primarily. The other criterion concerned the medical condition or surgical procedure, within each animal group, that (i) was performed by the most veterinarians, and (ii) provided the closest to a 50:50 distribution of analgesic users and nonusers. The final dataset was derived from 327 respondents, of whom 128 dealt primarily with beef animals, and 199 with dairy animals. The respective surgeries that best satisfied the second (other) criterion were the dehorning of beef animals older than 6 mo, and the dehorning of dairy animals up to 6 mo.

Statistical analyses

We considered 24 potential predictors of the likelihood of being an analgesic user (Table 2), including primary animal group, which we forced into the subsequent model. The linearity of the relationship of continuous variables with being an analgesic user was assessed by examination of smoothed scatterplots, with data transformation as necessary. The model building strategy involved 2 steps (10). First, all single variables were screened in a bivariate logistic regression model. Only variables significant

Table 2. Potential predictors considered in analyses to identify factors affecting the likelihood of Canadian veterinarians being analgesic users when dehorning beef and dairy calves

Veterinary demographic factors
Age
Gender
School of graduation
Number of years since graduation
Province where practising currently
Practice type (< 25% large animal, 25%–50% large animal, 51%–75% large animal, or > 75% large animal)
Number of veterinarians in the practice
Primary animal group worked with (beef or dairy)
Percentage of working time spent with primary animal group
Percentage of working time spent working with horses
Factors related to dehorning
Average number of cases performed annually
Veterinarian's perception of the average level of pain associated with dehorning if no analgesic were given [Scale of 1 (no pain) to 10 (the worst pain imaginable)]
Date of veterinarian's last attendance at continuing education about analgesia in cattle
Veterinarian's reported adequacy of knowledge about analgesia in cattle
Extent to which veterinarian agreed with statements about analgesia [Scale of 1 (disagree) to 10 (agree)], concerning their primary animal group[a]
"The risk of the animal damaging the surgical site because he/she no longer feels pain outweighs the benefits of giving analgesics"
"There are very few analgesics approved for use in these animals, so I can't easily provide analgesia for my patients"
"Owners are unwilling to pay for analgesia"
"The use of analgesics for common elective surgical procedures makes it safer for me to work with these animals"
"There are no analgesic drugs that are both long-acting and cost-effective"
The most highly rated of statements [Scale of 1 (disagree) to 10 (agree)] about the drawbacks of withdrawal periods, human abuse potential, record-keeping, and side effects, as relevant, when using opioids, alpha-2 agonists, dissociative anesthetics, local anesthetics, and nonsteroidal anti-inflammatory drugs (NSAIDs)[a]:
"The record-keeping required for opioids outweighs the benefits of using these drugs"
"In some or many cases, the long or unknown withdrawal periods of opioids in meat and/or milk outweigh the benefits of using these drugs"
"The human abuse potential of opioids outweighs the benefits of using these drugs"
"The risk of side-effects with opioids outweighs the benefits of using these drugs"
"In some or many cases, the long or unknown withdrawal periods of dissociative anesthetics in meat and/or milk outweigh the benefits of using these drugs"
"The human abuse potential of dissociative anesthetics outweighs the benefits of using these drugs"
"The risk of side-effects with dissociative anesthetics outweighs the benefits of using these drugs"
"In some or many cases, the long or unknown withdrawal periods of local anesthetics in meat and/or milk outweigh the benefits of using these drugs"
"The risk of side-effects with local anesthetics outweighs the benefits of using these drugs"
"In some or many cases, the long or unknown withdrawal periods of α-2 agonists in meat and/or milk outweigh the benefits of using these drugs"
"The risk of side-effects with α-2 agonists outweighs the benefits of using these drugs"
"In some or many cases, the long or unknown withdrawal periods of NSAIDs in meat and/or milk outweigh the benefits of using these drugs"
"The risk of side-effects with NSAIDs outweighs the benefits of using these drugs"
"The cost of analgesic drugs prohibits me from using them"

[a] Because the assumption of linearity of response was often not satisfied and for ease of interpretation of the results, we categorized responses to all the statements into 3 groups: Disagree (responses from 1 to 3), Neutral (responses from 4 to 6), and Agree (responses from 7 to 10)

at a P-value < 0.20 by Wald's test were then included in an analysis to identify those predictors that, collectively, had some association with being an analgesic user. The variables that best predicted analgesic use were identified by using a combination of backward stepwise logistic regression, and manual comparisons of possible models ($P \leq 0.05$). Primary animal group (dairy or beef) was forced into the model. Clinically plausible confounding variables (age, gender, school of graduation, number of veterinarians in the practice, practice type, and average annual number of dehornings) and interaction terms were assessed, applying the Bonferroni correction. The model's fit and adequacy were assessed by using the Hosmer-Lemeshow χ^2 statistic, area under receiver operating characteristics (ROC) curves, and standardized residuals (10).

A similar procedure, involving the same potential risk factors, was used to examine factors affecting veterinarians' perception of the pain associated with dehorning if no analgesia were used. That variable was not normally distributed and could not be normalized by transformation. Based on its distribution, the pain variable was dichotomized as "Very painful" (pain ratings from 8 to 10) and "Less than very painful" (pain ratings from 1 to 7). For comparison purposes, 3-level ordinal and multinomial logistic models were also fit, using the same predictors that were significant in the logistic model. No substantive changes in the magnitude of direction of the coefficients were seen (data not shown), so the results of the logistic model are presented. All statistical analyses were performed by using specialized software (Stata, version 8; Stata Corporation, College Station, Texas, USA).

Results

Not all selected respondents provided data on all variables. The pain variable had the largest number of missing values (32/327; 10%). Eight veterinarians (8/327; 2.5%) had graduated in 2004 and, therefore, could not provide annual estimates of the number of dehornings performed. Their data were included because they comprised such a small percentage of the whole.

Table 3. Factors with the potential to affect analgesic use for dehorning of calves: Descriptive statistics and unconditional associations ($P < 0.2$)

	Analgesic nonusers (N = 91)			Analgesic users (N = 236)			
Variable name	n[a]	%	Mean (s[b])	n[a]	%	Mean (s[b])	P
Animal group dealt with primarily							< 0.001
Beef	50	54.9	—	78	33.1	—	
Dairy	41	45.1	—	158	66.9	—	
Veterinarian's gender			—			—	0.153
Male	60	66.7	—	176	74.6	—	
Female	30	33.3	—	60	25.4	—	
Region							< 0.001
Atlantic Canada	12	13.2	—	29	12.3	—	
Quebec	14	15.4	—	71	30.1	—	
Ontario	22	24.2	—	54	22.9	—	
Manitoba, Saskatchewan	30	32.9	—	26	11.0	—	
Alberta, British Columbia	13	14.3	—	56	23.7	—	
School of graduation							0.002
Atlantic Veterinary College	13	14.3	—	16	6.8	—	
Ontario Veterinary College	24	26.3	—	70	29.7	—	
Western College of Veterinary Medicine	37	40.7	—	69	29.2	—	
Université de Montréal	12	13.2	—	74	31.4	—	
Other	5	5.5	—	7	2.9	—	
Number of veterinarians in the practice							0.04
1	18	20.0	—	23	9.7	—	
2 to 4	40	44.4	—	109	46.2	—	
5 or more	32	35.6	—	104	44.1	—	
% working time spent with dairy or beef cattle, as appropriate (quadratic transformation)							
% time (centered)	89	—	-0.18 (28.6)	234	—	5.9 (30.9)	0.184
% time (quadratic term)	89	—	807.9 (787.8)	234	—	986.2 (786.5)	0.117
Number of dehornings performed annually							0.125
0 to 200	83	91.2	—	200	84.7	—	
> 200	8	8.8	—	36	15.3	—	
Average level of pain if no analgesic were given (on a scale of 1 to 10) (quadratic transformation)							
Pain score (centered)	84	—	0.43 (1.9)	211	—	1.7 (2.2)	< 0.001
Pain score (quadratic terms)	84	—	3.9 (4.4)	211	—	7.7 (6.2)	< 0.001
Owners are unwilling to pay for analgesia							0.004
Disagree	31	35.6	—	126	53.9	—	
Neutral	20	23.0	—	52	22.2	—	
Agree	36	41.4	—	56	23.9	—	
Opioids: the human abuse potential, record keeping, side effects, or long or unknown withdrawal periods in meat outweigh the benefits of using the drugs							0.014
Disagree	12	13.8	—	36	15.5	—	
Neutral	26	29.9	—	36	15.4	—	
Agree	49	56.3	—	161	69.1	—	

[a] For some variables, missing data meant that the total of $n < N$
[b] Standard deviation

Analgesic use

Approximately 72% (236/327) of respondents were analgesic users. Among all the potential predictors of analgesic use, 3 showed a quadratic relationship to the outcome. These 3 variables were pain; the % of working time spent with beef or dairy cattle respectively; and the % of working time spent with horses. These data were centered (based on logit-transformed, smoothed plots) and quadratically transformed. The average annual number of dehornings also did not have a linear relationship to the outcome and was dichotomized at 200 (based on logit-transformed smoothed scatterplots). In the case of school of graduation, the small number of veterinarians who had graduated from schools outside Canada precluded including them as a separate group, so they were combined with graduates of the Université de Montréal (the school with an identical distribution of pain perception scores). Univariate analyses of these and all other potential predictors identified 10 variables that were associated with analgesic use (Table 3).

The quadratic pain term was significant in the final logistic regression model (OR = 1.12, $P < 0.001$). Examination of a

Table 4. Final logistic regression model of factors associated with veterinarians' use of analgesics in calves undergoing dehorning (dairy calves up to 6 mo old; beef calves over 6 mo old)

Predictor	Odds ratio	95% confidence interval	*P*
Veterinarian works primarily with dairy animals	3.7	1.3, 10.4	0.012
Veterinarian agrees that "Owners are unwilling to pay for analgesia"	0.92	0.37, 2.3	0.85
Interaction: primarily dairy × owners are unwilling to pay	0.25	0.07, 0.93	0.038
Veterinarian's perception of the pain caused by dehorning without analgesia	1.7	1.4, 2.0	< 0.001
Region where practice located[a]			
Quebec	1.2	0.42, 3.6	0.71
Ontario	1.4	0.51, 4.0	0.50
Manitoba, Saskatchewan	0.85	0.27, 2.7	0.79
Alberta, British Columbia	5.9	1.7, 20.5	0.005

[a] Compared with Atlantic Canada

probability plot suggested that the significance resulted from 21 respondents all of whom gave low pain ratings, but most of whom (N = 16) were analgesic users. The 21 respondents were similar to the others in age, gender, school of graduation, the region of Canada where they worked, the percentage of their time spent on large animal work, the number of veterinarians in their practice, and the primary animal group dealt with. Relatively more (90.1%; 19/21) of the 21 respondents disagreed with or were neutral about the statement "Owners are unwilling to pay for analgesia" than was the case among the other veterinarians (69.9%; 188/269). When the 21 respondents were excluded from the final model, the quadratic pain term was not significant ($P = 0.145$) and the coefficients of the remaining variables did not change substantially. While discarding data is never desirable, it was necessary to avoid having ill-fitting models and there was no rational basis for the quadratic nature of the pain perception variable. Consequently, all remaining analyses were conducted with a data set that excluded the anomalous data (N = 21) and quadratic pain term, and used the original pain term.

When the model was rebuilt with the anomalous data removed, it contained the same predictors as when the anomalous data were included (Table 4). Concern about owners' willingness to pay was a significant predictor; within it, the categories "Neutral" and "Disagree" were not significantly different from each other, and those 2 levels were therefore combined, creating a dichotomous variable. When relevant, potential confounding variables (age, gender, school of graduation, annual number of cases of dehorning, number of veterinarians in the practice, and practice type) were forced into the model; they did not alter the odds ratios substantially. There was a significant interaction between primary species and perception of owners' willingness to pay. The regression model fit the data (Hosmer Lemeshow $\chi^2 = 2.6$, $P = 0.63$); its predictive ability (area under ROC curve) was 83.4%.

The regression model (Table 4) indicates that a veterinarian whose perception of pain was 2 units higher than that of a colleague would be approximately 3 times ($1.7^2 = 2.9$) more likely to give analgesia to all his or her cases of dehorning. Veterinarians working in Alberta or British Columbia (BC) were almost 6 times more likely to give analgesic drugs to all cases of dehorning than were veterinarians located in Atlantic Canada. Veterinarians working with dairy animals were some 4 times more likely to be analgesic users. Opinions about owners' willingness to pay had little influence on the odds of being an analgesic user among veterinarians working primarily with beef cattle. However, the interaction term indicates that veterinarians were much less likely to be analgesic users if they worked primarily with dairy cattle and perceived that owners were unwilling to pay for analgesia.

Only one respondent had strongly influential data (standardized residual = -9.1); the model in Table 4 includes those data. The respondent dealt primarily with dairy animals and was not an analgesic user (gave analgesia to only 50% of dehorning cases), although he/she worked in Alberta or BC, rated dehorning as maximally painful, and disagreed that owners are unwilling to pay for analgesia (Table 4). When the model was refit without that respondent's data, the positive effect of working in Alberta or BC increased (OR = 8.2; 95% CI = 2.2, 29.8; $P = 0.001$), as did the positive effect of primary species being dairy (OR = 4.7; 95% CI = 1.6, 13.6; $P = 0.004$). The effects of pain perception and of the interaction term were almost unchanged.

Pain perception

The data analyzed included those data from the 21 respondents who were excluded from the analysis of analgesic use, in order to capture all possible information concerning pain perception (Table 5). Approximately 58% (172/295) of respondents were in the "Very painful" group. There was a quadratic relationship between pain perception and the proportion of time spent working with the respective primary animal groups. In addition, the distribution of data justified combining the "Disagree" and "Neutral" categories, for the opinion about the safety benefit of using analgesics, and combining the "Agree" and "Neutral" categories of the opinion about

Table 5. Factors with the potential to affect veterinarians' perception of the pain caused by bovine dehorning in the first 24 hours after surgery, if no analgesics were given: Descriptive statistics and unconditional associations ($P < 0.2$)

	Not very painful (N = 123)			Very painful (N = 172)			
Variable name	n[a]	%	Mean (s[b])	n[a]	%	Mean (s[b])	P
Animal group dealt with primarily			—			—	0.101
Beef	56	45.5			62	36.1	
Dairy	67	54.5			110	63.9	
School of graduation			—				0.06
Atlantic Veterinary College	13	10.6	—	14	8.2	—	
Ontario Veterinary College	31	25.2	—	58	33.7	—	
Western College of Veterinary Medicine	53	43.1	—	48	27.9	—	
Université de Montréal	23	18.7	—	46	26.7	—	
Other	3	2.4	—	6	3.5		
% working time spent with dairy or beef cattle, as appropriate (quadratic transformation)							0.144
% time (centered)	121	—	1.18 (28.2)	171	—	4.4 (30.7)	0.53
% time (quadratic term)	121	—	788 (746)	171	—	958 (787)	0.08
% working time spent with horses	123		14.1 (18.5)	171		11.5 (16.5)	0.198
Owners are unwilling to pay for analgesia			—		—		0.01
Disagree	47	39.2	—	94	55.3	—	
Neutral	36	30	—	30	17.6	—	
Agree	37	30.8	—	46	27.1	—	
The use of analgesics for common elective surgical procedures makes it safer for me to work on these animals							0.01
Disagree	6	5.0	—	4	2.4	—	
Neutral	14	11.7	—	6	3.5	—	
Agree	100	83.3	—	159	94.1	—	
The risk of side effects or of long or unknown withdrawal periods outweighs the benefits of using local anesthetics							0
Disagree	95	78.5		152	91.0		
Neutral	18	14.9		9	5.4		
Agree	8	6.6		6	3.6		
The risk of side effects or of long or unknown withdrawal periods outweighs the benefits of using alpha-2 agonists							0.02
Disagree	59	49.6		96	57.5		
Neutral	18	15.1		37	22.2		
Agree	42	35.3		34	20.3		

[a] For some variables, missing data meant that the total of $n < N$
[b] Standard deviation

local anesthesia. Again, data from the small number of veterinarians who had graduated outside Canada were combined with those of the graduates of the Université de Montréal. Univariate analysis identified 8 potential predictors of pain perception. The initial logistic regression model indicated that veterinarians who were neutral on the question of owners' willingness to pay were less likely to provide analgesia than were veterinarians who agreed that owners were unwilling to pay. However, a test of linear combination indicated no difference between those 2 levels of the variable; therefore, they were combined.

The final model identified 2 significant predictors of pain perception: perception of owners' willingness to pay, and the perception that using analgesia creates safer working conditions. When this model was run with the outcome as a 3-level, categorical variable (pain perception classified in 3 groups with scores of 1–5, 6–7, and 8–10), using either multinomial or ordinal regression, the result was the same; therefore, the logistic approach was retained. No interaction or confounding was apparent and there were no strongly influential variables. Table 6 shows the final model for pain perception; it fit the data [Hosmer Lemeshow χ^2 =1.4, P = 0.49; and its predictive ability (area under receiver operating characteristics (ROC)) curve] was 63.5%. Veterinarians concerned about their safety were 3 times more likely than those unconcerned with safety to perceive dehorning as very painful, but concern about owners' willingness to pay halved the odds of perceiving dehorning as very painful (Table 6).

Discussion

To our knowledge, the data provide the first examination of factors affecting veterinarians' use of analgesic drugs for a routine surgical procedure in farm animals in North America. The response rate of 50% is reasonable, given the length of the questionnaire and the detailed nature of the information requested. While selection bias arising from nonresponse may bias observed associations, it is only likely to do so if the nonresponse is associated with both the outcome of interest (analgesic use or pain perception) and the factor(s) under investigation. With no data available for the nonresponders, this was impossible to evaluate.

Table 6. Final logistic regression model of factors affecting Canadian veterinarians' perception that dehorning calves without any analgesia is very painful (dairy calves up to 6 mo old; beef calves over 6 mo old)

Predictor	Odds ratio	95% confidence interval	*P*
Veterinarian works primarily with dairy animals	1.3	0.81, 2.2	0.265
Veterinarian agrees that "Owners are unwilling to pay for analgesia"	0.58	0.35, 0.94	0.029
Veterinarian agrees that using analgesics "makes it safer for me to work on these animals"	2.7	1.2, 6.2	0.015

Furthermore, the response rate of 50% is approximately twice that of comparable surveys in the United Kingdom (2,3,5).

The predictors of analgesic use indicate that, as with small animal veterinarians performing canine ovariohysterectomy (1), the perception that dehorning is painful makes a veterinarian more likely to use analgesics. Unlike these small animal veterinarians (1), however, school of graduation did not influence analgesic use, but practice location did. There was a strong association between the region where the practice was located and the likelihood of the veterinarian being an analgesic user. Veterinarians in Alberta or BC were almost 6 times more likely to use analgesics when dehorning calves than were their counterparts in Atlantic Canada (Table 4). This difference may be due to the relative prosperity of Alberta and BC or the high profile of animal welfare in these provinces. Both the Alberta and BC veterinary medical associations (VMA) have animal welfare committees, and the BC VMA contributes to the animal welfare program at the University of British Columbia, where research has been conducted on the management of pain caused by dehorning (11,12). Members of the BC program are also active in educating farmers who may, in turn, be more likely to support the use of analgesic drugs when dehorning calves. Similarly, Alberta Farm Animal Care (AFAC) is very active in educating farmers and veterinarians about animal welfare. The Alberta program has highlighted pain management in its newsletter and has recently developed an information sheet for farmers about pain management in farmed animals (7,8,13). In contrast, Saskatchewan has academic research and animal welfare programs similar to those in BC, but veterinarians located in Saskatchewan and Manitoba were no more likely to use analgesics for dehorning calves than were their counterparts in Atlantic Canada. These results may be due to regional differences in academic research or animal welfare programs, prevailing economic conditions, or other factors not addressed in this survey.

Veterinarians' concern about owners' willingness to pay showed both direct and indirect negative relationships with the likelihood that veterinarians were analgesic users. While the model cannot demonstrate causal relationships, the results suggest that veterinarians for whom cost is an important factor in the use of analgesic drugs when dehorning, and who assume or perceive that owners are unwilling to pay, may rationalize nonuse of analgesia with the belief that dehorning does not hurt very much. Such rationalization, if it occurs, might be a form of self-protection in the face of knowingly inflicting pain while feeling unable to prevent or manage it (14). However, modern research and knowledge of the pain pathway indicate clearly that dehorning without analgesia causes acute and protracted pain (11,12,15–18). Appropriate analgesic drugs for dehorning are lidocaine, with or without xylazine, and ketoprofen or flunixin, none of which is expensive when used for calves. In larger calves, in particular, the time taken for lidocaine to take effect is offset by ease of handling, which permits more rapid dehorning and increased safety of the handler and veterinarian. That some veterinarians do not use analgesia because they perceive that farmers are unwilling to pay may also reflect the lack of Canadian legislation requiring analgesia to be provided. In contrast, UK law forbids the dehorning of calves without pain management (19).

The dataset concerned young dairy calves and older beef calves, 2 groups that are different in bodyweight, ease of handling, and, in many cases, method of dehorning (the questionnaire did not ask about method of dehorning). Although the variable "primary animal group" was forced into the model, it represented a compound of the above 3 animal-related factors, and the aspect of working principally with 1 animal group. The role of these components of the variable is unclear. However, the finding that, when dairy is the primary farm species worked with, veterinarians are more likely to be analgesic users is consistent with anecdotal reports and the nature of dairy husbandry. The interaction between working primarily with dairy cattle and being concerned about owners' willingness to pay for analgesia is likely to have arisen because most dairy calves are dehorned when very young, and therefore are easier to restrain and to dehorn quickly than are beef calves over 6 mo. Thus, veterinarians were perhaps reluctant to recommend and use analgesia if they perceived dairy owners to be unwilling to pay for it. A further consideration is that, for reasons of questionnaire length, the question about owners' willingness to pay for analgesia referred to each of the 4 animal groups in general, and was not asked in the case of each surgical procedure, in this case, dehorning.

Both factors identified in the model for pain perception concerned opinions, not factual variables such as demographic characteristics. This result and the rather low predictive ability of the statistical model itself may have arisen partly because of (i) the subjectivity of the pain scale that we used in the survey and (ii) pain assessment in the field, which, together, may have made the pain data quite inaccurate. A survey of a convenience sample of 68 bovine veterinarians in the UK suggested that veterinarians would find it useful to have a formal method for

assessing pain in practice (4). The authors of that study are developing a method of assessing inflammatory pain in dairy cows (McMullan et al, personal communication). Our model also suggests that veterinarians have a conflict of opinions that affects their perception that dehorning is painful. Even where respondents perceived that owners are unwilling to pay for analgesia, they were more concerned about their own safety, knowing that injury is more likely if the calf struggles during dehorning. This legitimate concern somewhat offset the perception that owners were not otherwise willing to pay for analgesia, and suggests that veterinarians may be more likely to acknowledge and prevent the certain pain caused to animals by dehorning, if they are also concerned about the possibility of pain and injury being inflicted on themselves by accident.

It is noteworthy that neither veterinarians' gender nor the number of years since they had graduated had any detectable collective influence on pain perception or analgesic usage when other variables were included in the analysis. That neither factor had a detectable effect in the final model contradicts the stereotype of food animal veterinarians, but it also suggests that those veterinarians' sensitivity to animals' pain may be overridden by anthropic concerns. In a comparable national study of factors affecting perioperative analgesic usage by small animal veterinarians in Canada in 1994, women gave significantly higher pain ratings than men for the target surgery (canine abdominal surgery) (20). Also, veterinarians who had graduated more recently attributed more pain to the procedure than did more long-established graduates (20). When that survey was repeated in 2001, no gender difference was found and average pain ratings were higher than in 1994 (1). This suggested that men now had increased sensitivity to pain in their patients. However, unlike in our large animal study, the number of years since graduation still had an inverse relationship with pain rating (1).

Our survey did not examine the influence of veterinarians' background on their management of pain in food animals, but recent research at veterinary schools in the US suggests that, currently, students from rural backgrounds are less concerned about the capacity of farm animals to suffer than are those from urban backgrounds (21,22). While it is not clear if that has been true of Canadian students, our finding that a substantial minority of veterinarians did not use analgesia for dehorning [and other surgeries in food animals (9)], combined with the US research (21,22) indicates that veterinary schools and the profession must ensure that veterinarians and veterinary students understand fully and apply the modern knowledge about pain management in food animals.

It is likely that more widely available continuing education (CE) about pain management in food animals would address most of the factors that reduce the likelihood of veterinarians' use of analgesics for dehorning. Respondents indicated that lectures and wet labs at the provincial or regional level and review articles in journals were their preferred routes of CE, although 1 respondent commented that CE about pain management in food animals was not widely available (9). Continuing education should include the following: an explanation of the pain pathway with emphasis on the evidence that dehorning (and other surgical procedures) causes significant pain when performed without analgesia; and an explanation of appropriate pain management protocols, with practical guidance about client communication and the promotion of analgesic usage to animal owners. Testimony from cattle veterinarians who use analgesia for dehorning and other routine surgeries may also be helpful, as may client education, particularly in the provinces outside Alberta and BC.

In conclusion, the growing public concern about farm animal welfare and the higher standards of pain management mandated in countries such as the UK (19) make it doubly important that Canadian veterinarians fulfill their ethical obligation not to inflict pain on the animals entrusted to their care by not performing surgery without pain relief. Future surveys would help the profession monitor its progress in this area. The response rate of 50%, despite the fact that the survey was quite long and detailed, suggests that many veterinarians would participate in future surveys. CVJ

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